A NEW TECHNIQUE TO CONTROL INSECT INFESTATION IN MAS MIN

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A process of heat treating *Mas min* at 125° C for 15 minutes and hermetically packing them up has been investigated. This method has been found to be successful in controlling insect infestation in *Mas min*. The Japanese method of packing *Mas min* in BHC coated containers has also been simultaneously examined and found successful under certain conditions. However, this process is found to impart slight undesirable flavours to the product. In addition, this chemical treatment is also likely to be more costly.

INTRODUCTION

The coral island of Minicoy, located off the west coast of India (Latitude 8° 7′ N., Longitude 73° 18′ E) is well known for its rich tuna fishery. Almost the entire bulk of the tuna landed here is processed by a special method into *Mas min*, a product almost similar to *Katsuobushi* of Japan. The method of processing *Mas min* is not a strictly standardised one. The main features of processing are as follows. The tuna fish, filleted into chunks is boiled in light brine. The meat is drained and directly hot smoked in a kiln. They are then dried on old coir mats spread out on the open beach, till they attain the consistency of wood. The product is then exposed to damp air to promote mould growth. This is supposed to enhance the flavour and shelf-life of *Mas min*. The finished product usually has a moisture content of 17 to 21% and Sodium chloride content of 2 to 5%. The product is packed in gunny bags and is exported to countries like Ceylon, Singapore, Malaya etc. *Mas min* is considered a delicacy in these South East Asian countries and finds good demand. The *Mas min* industry, though not a well organised one, is very extensive and in fact contributes to the major share of the island's economy.

In view of the very low moisture content of *Mas min*, the bacterial and enzymatic deterioration of the product is comparatively very little and gradual. However, the product is found to be highly susceptible to insect infestation and consequent

TABLE I

Details of treatment of Mas min and its respective container				
Sample No.	Type of packing	Whether insecticide coated or not	Whether package is air tight or not	Whether Mas Min is heat treated on not
1.	Sealed in polythene and packed in wooden box	Not coated	Air tight	Not heat treated
2.	Sealed in polythene and packed in wooden box	Not coated	Air tight	Heat treated
3.	Sealed in polythene and packed in wooden box	Box alone coated	Air tight	Not heat treated
4.	Sealed in polythene and packed in wooden box	Box alone coated	Air tight	Heat treated
5.	Tar polythene gunny bag	Not coated	Not air tight	Not heat treated
6.	Tar polythene gunny bag	Not coated	Not air tight	Heat treated
7.	Tar polythene gunny bag	Coated externally	Not air tight	Not heat treated
8.	Tar polythene gunny bag	Coated externally	Not air tight	Heat treated
9.	Glass bottle with lid	Not coated	Not air tight	Not heat treated
10.	Glass bottle with lid	Not coated	Not air tight	Heat treated
11.	Sealed in polythene bag	Not coated	Air tight	Not heat treated
12.	Sealed in polythene bag	Not coated	Air tight	Heat treated

Effect of treatment on insect infestation and flavour of the product

When insect infestation first appeared	Intensity of infestation	Whether Chemical flavour is present or not	Remarks
Initially slight which intensified after for 4 weeks	Gradually intensified	Not present	Not effective
No infestation at all (56 weeks)	Nil	Nil	Very effective
Very slight during the first 4 weeks and then got arrested	Infestation got arrested	Slight BHC smell	Though effective had and undesire-able BHC smell
No infestation at all (56 weeks)	Nil	Slight BHC smell	Though effective had an undesir-able BHC smell
Initially slight which intensified after 4 weeks	Gradually intensified	Nil	Not effective
After 12 weeks	Gradually intensified	Nil	Partially effective
Initially slight which intensified afier 4 weeks	Gradually intensified	Not detectable	Not effective
After 16 weeks	Gradually intensified	Not detectable	Partially effective
Initially slight which intensified after 4 weeks	Gradually intensified	Nil	Not effective
After 16 weeks	Gradually intensified	Nil	Partially effective
Initially slight which intensified after 4 weeks	Gradually intensified	Nil	Not effective
No infestation at all (56 weeks)	Nil	Nil	Very effective

spoilage. This sort of spoilage is usually found to set in when the product is in storage. Once the insect infestation sets in the product gradually gets reduced to a fine powder. Consequently the value of the product also goes down. The magnitude of depredation brought about by insects is enormous and poses a serious problem to *Mas min* industry.

Nonaka (1955) has also reported identical insect infestation in the storage of *Katsuobushi* in Japan. These harmful insects have been found to belong to *Corynestes* sp and *Dermestes* sp. A study initiated in India by Soans and Adolph (1968) has indicated that most of the depredation in *Mas min* is brought about by mites belonging to *Lardoglyphus konoi* (Sasa and Asanuma) and Tyrophagus putrencentiae (Schrank) and also beetles belonging to *Necrobia* rufipes (De Geer) and *Dermestes* sp. The beetles are found to burrow holes in the product and crumble it down to pieces. The mite infestation appears as a sudden bloom and gradually the entire hard mass is reduced to fine powder.

With the pupose of protecting food products from insects many methods have been tried in different countries eg. fumigation by carbon-di-sulphide, cynogen gas, chloropicrine etc., sealing in an atmosphere of carbondioxide or nitrogen and also keeping in cold storage. In Minicoy, the islanders claim temporary protection against insect menace by covering the finished product with dry loose sand. As long as the product is under sand the insect activity may be kept in curb.

However, when they are packed in gunny bags, prior to export, the insect attack sets in again. There is also reason to suspect that this process of covering with sand itself may be one of the sources of contamination of *Mas min* with insect eggs or larvae. Alternatively the contamination can also take place while the product is being dried in the open beach or when the *Mas min* is kept for moulding or when the product is in store in loosely woven gunny bags. Under favourable conditions these insect eggs and larvae hatch out and start on their depredation.

Most of these insect control techniques have been found to be either unsatisfactory or too costly. Some of the fumigation methods were found to impart slight undesirable flavours to the products or at times even caused toxic effects on consumers. Hence, the efficacy of a new process of heat treatment to destroy the initial load of insects and their eggs in *Mas min* and then keeping them stored without further insect contamination is investigated in this study. Side by side with the above process, the usefulness of Benzene Hexachloride coated containers for storing *Mas min* as suggested by Nonaka (Loc cit) has also been examined in this study.

Experimental

Freshly prepared *Mas min* (Commercial quality) procured specially for the purpose from Minicoy was used for all these expts. The sample was divided into two lots. One lot was kept as control without any treatment. The other lot was uniformly spread inside a thermostatically controlled air oven maintained at a temperature of 125°C. After maintaining this temperature for 15 minutes, the air oven was put off and it was allowed to cool down to 65°C. This took about 55 minutes. This cooling was found necessary lest the overheat may impair the polythene packages. Since, *Mas min* during the process of preparation is precooked and then smoked at high temp (55 to 125°C) and then dried to very hard consistency,

this heat treatment process was not found to affect the quality of the product to any appreciable extent. The heat treated products and the untreated control samples were further divided into lots and were speedily transferred to their respective containers. In this study containers like wooden boxes with lids, glass bottles, tar–polythene lined gunny bags and ordinary 300 gauge sealed polythenc bags were tried. In the case of wooden boxes the *Mas min* was put only after sealing them in polythene bags. Of these, tarpolythene gunny bags and glass bottles were not air tight packs and hence had access for insect contamination from the surroundings.

In order to determine the efficacy of Benzene hexachloride treated containers, the following procedure was adopted. A 3% trichlor ethylene solution of Benzene hexachloride containing 0 05% Vinyl acetate as an adhesive agent was applied uniformly to two of the tarpolythene gunny bags (out side only) and two of the wooden boxes. They were then completly dried. The control samples as well as the heat sterilised samples were separately packed into each of these 12 containers as detailed in Table 1 and were kept on shelves under periodic examination for a total period of one year. The insect infestation was assessed only by visual observation, by means of a hand lens for the presence of insects and the powdering and crumbling caused by these insects.

Results and discussion

The results and observations made through this one year study period are summarised in Table 1.

In this study, sample Nos. 2, 4, 6, 8, 10 and 12 refer to heat treated *Mas min* packed in different containers. Of these, sample Nos. 2, 4 & 12 gave complete protection against insect infestation for the entire period of observation. However, in sample Nos. 6,8 and 10 it gave only partial protection for the initial 12 to 16 weeks' period. This finding indicates that even though, heat treatment initially decontaminated these samples, they might have subsequently been affected by a fresh ingress of the insects from their surroundings, because all these three packages were not sealed air tight. It may be noted that sample Nos. 2,4 & 12 were hermetically sealed in alkathene bags immediately after heat treatment and hence there was no scope of further ingress of insects into the products. From this, it follows that for heat treatment to be effective the treated product must be sealed hermetically.

The assumption that even the freshly prepared commercial *Mas min* is a potential carrier of insect infestation is corroborated by the observation on sample Nos. one and eleven. Even though these samples were hermetically sealed in polythene cover, both the samples were affected by insects within the first month itself, which gradually intensified.

This study also revealed that the application of Benzene hexachloride coating on the containers (sample Nos. 3,4,7 & 8) has also certain amount of insect inhibitive properties as evidenced by sample No. 3. In this case, only untreated sample was hermetically sealed in polythene case and stored in the insecticide coated box. As this sample is not subjected to heat treatment one could have normally expected insect infestation in this sample also. However, there was only a slight initial insect attaek which subsequently got arrested. It was found that the polythene cover as well as the *Mas min* inside had slightly absorbed the characteristic smell of B. H. C. This might have happened by

a slow process of diffusion. In all probability, this B. H. C. smell might have inhibited the insect proliferation and the consequent damage. Even though, an identical result should have normally occurred in sample No. 7 (tar polythene gunny bag coated with B. H. C. mixture and containing untreated *Mas min*), it did not take place. It may be noted that all these sample packets were kept exposed to atmosphere and since in this case (sample No. 7) B. H. C. coating was on the outer surface, the B. H. C. vapour might have been wafted off without functioning as a protective agent on the products inside. Further, the tar polythene pack was not sealed air tight and there was plenty of scope for fresh ingress of insects into the bag. This possibly explains the failure of the insecticide coating and heat treatment in all the tar polythene gunny bag packings.

Conclusion

From the above it can be concluded that heat treatment of *Mas min* at a temp. of 125°C for a period of 15 minutes and then hermetically sealing them up from further insect contamination is an effective way of protecting *Mas min* from the destruction caused by insects.

Even though, Insecticide coating of the containers has a certain amount of inhibitive properties on insect attack, it is not found very essential when heat treatment process if adopted. This insecticide coating, in addition to being costly, has also the tendency to impart undesirable flavours to the product inside. As indicated by West and Eliot (1961) insecticides like B. H. C. and D. D. T. if excessively absorbed, may also cause toxic effects on the consumers.

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